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## (54) A device for performing examinations and interventions in the abdominal cavity of a patient

(57) A device for use in performing examinations and surgical interventions within the abdominal cavity of a patient comprises a cowling (1) having a marginal area (2) which is applicable to the abdominal integument (10) of the patient and which is provided with an upper temporarily closable opening (3) in communication with an annular projection (4) which is directed into the inside of the cowling (1) and which has a free end (5) which is applicable in hermetic contact with the abdominal integument (10), whereby a negative pressure generated within the cowling (1) raises the abdominal integument. Instruments may thereupon be inserted through the opening (3) and via the abdominal integument (10) into the abdominal cavity without damaging any internal organs and vessels which were initially in contact with the inner side of the abdominal integument (10).

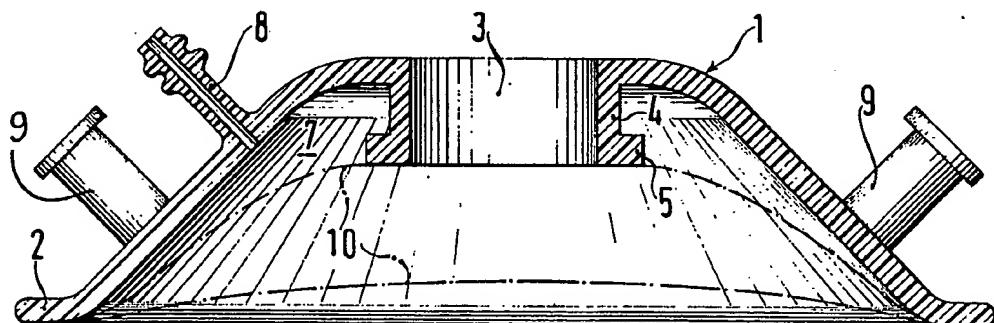


FIG. 1

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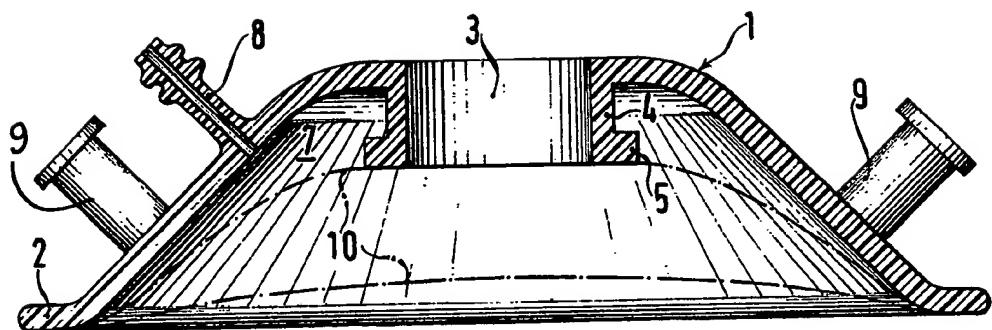
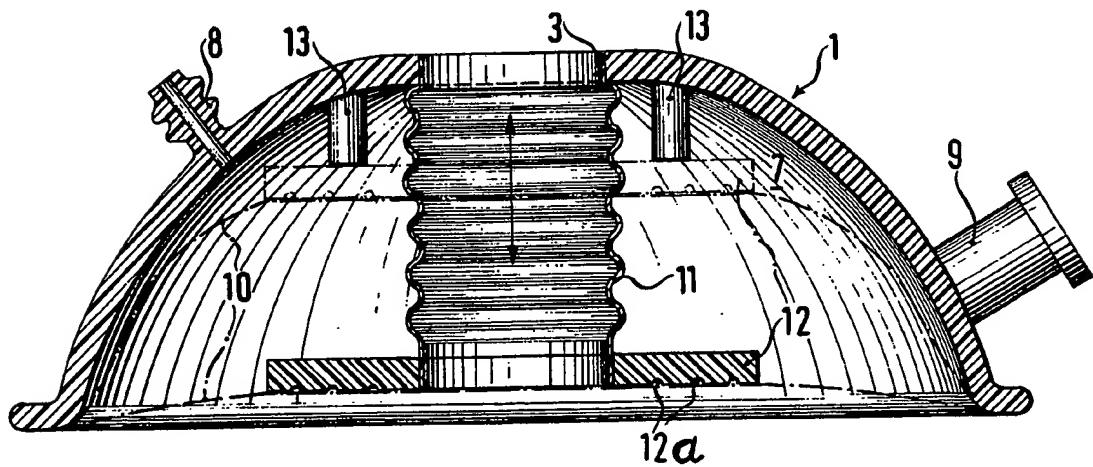


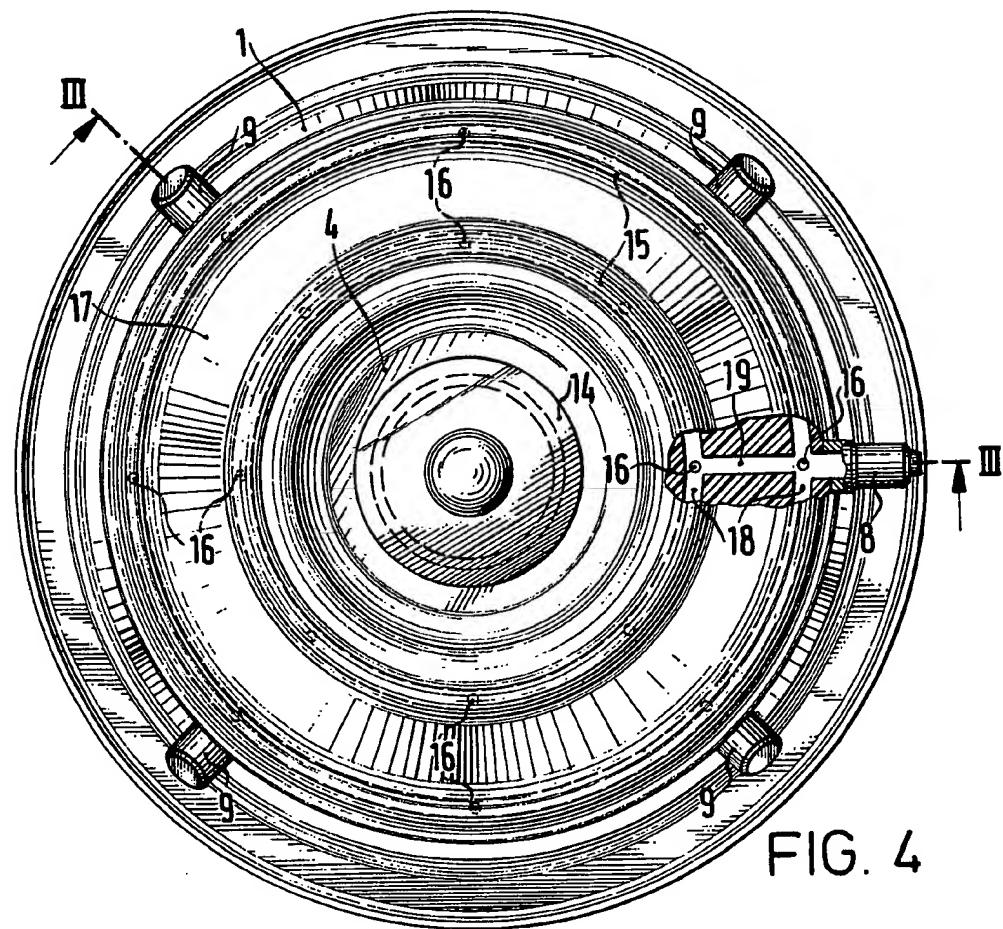
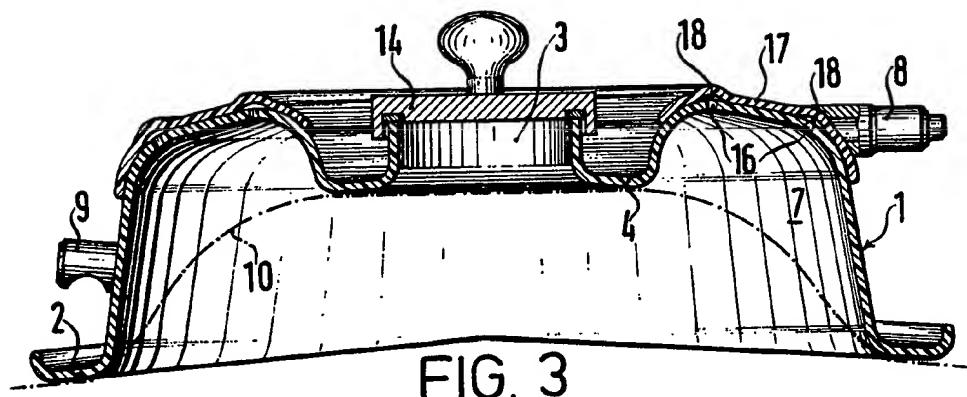
FIG. 1

FIG. 2



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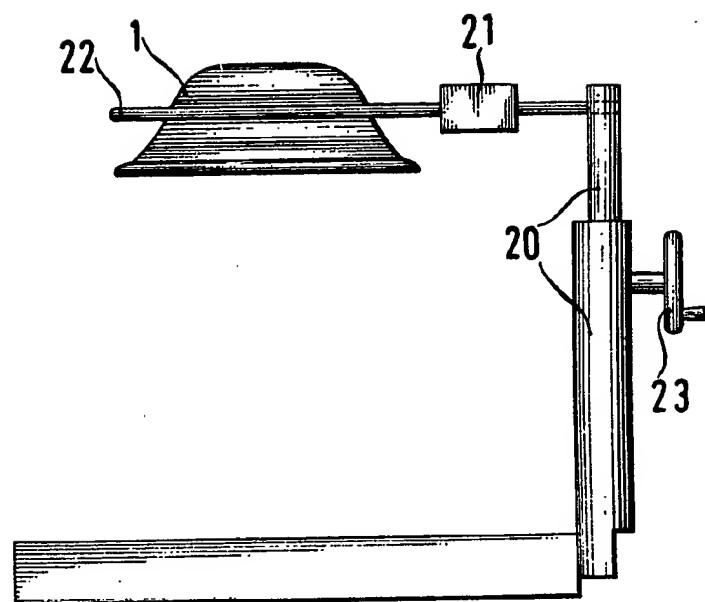
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FIG. 5



## SPECIFICATION

A device for performing examinations and interventions in the abdominal cavity of a patient

5 This invention relates to a device for performing examinations by means of laparoscopes and for performing surgical interventions within the abdominal cavity of patients.

10 Abdominal integuments have to be transpierced for examination of the abdominal cavities of patients by means of laparoscopes and for the performing of surgical interventions in the abdominal cavity, for the insertion of a cannula, by means of which the abdominal cavity may be filled 15 with an inert gas and the abdominal integument may be raised, so that instruments may be inserted through the abdominal integument without danger to the internal organs. The perforation of the abdominal integument raises 20 the risk of injuring internal organs, in particular intestinal loops and vessels, lying in contact with the inner side of the abdominal integument. Other disadvantages of the known method consist in that it is of time-consuming nature, since say 4 to 25 6 litres of gas must be blown into the abdominal cavity to raise the abdominal integument, which requires a period of at least ten minutes. Although this gas is released again or emerges from the abdominal cavity through the aperture present in 30 the abdominal integument after completion of the examination or operation, gaseous residues are left behind in said abdominal cavity, which afflict the patient with difficulties for a period of several days. Finally, the known method is also 35 disadvantageous and onerous in its application inasmuch as it requires covering the parts of the body around the location where the abdominal integument is perforated, so that sterile conditions during interventions are assured.

40 The main object of the present invention is to provide a device whereby the abdominal integument may be lifted off the internal organs without application of a pneumoperitoneum, and which is intended to allow of transpiercing the 45 abdominal integument in its raised position, so that instruments may subsequently be inserted and examinations and interventions may be performed within the abdominal cavity.

To this end, the present invention consists in a 50 device for use in performing examinations and interventions within an abdominal cavity of a patient, said device being characterized by a cowling having a marginal area which is adapted to be placed in contact with the abdominal 55 integument, means defining a temporarily closable opening in an upper portion of said cowling, and an annular projection directed into the inside of the cowling, said annular projection having a free end which is applicable in hermetic contact with 60 the abdominal integument, whereby the abdominal integument may be raised by generating a negative pressure within the cowling.

By means of the invention, the abdominal integument may be lifted off the internal organs

65 and vessels by means of the negative pressure within the cowling, so that the abdominal integument may be transpierced subsequently via the opening in the cowling and instruments may be inserted through the same opening into the 70 abdominal cavity for examinations and surgical interventions. In the case of a complementarily required application of a pneumoperitoneum, it is assured that a cannula may be pushed through the raised abdominal integument without injury to 75 internal organs and vessels.

Advantageously, the opening in the cowling is centrally disposed.

In one embodiment of the invention, the annular projection constitutes an extension of the 80 periphery of said opening and is in the form of a tubular stub.

Preferably, the opening in the cowling is closed off, after being placed on the abdominal integument, with a hand or by means of a 85 hermetically applicable and removable cover, until the abdominal integument is caused to establish a hermetic seal between the internal volume of the cowling and the atmosphere by contact with the annular projection, by means of the negative 90 pressure applied. The hand or cover may be lifted off subsequently, so that instruments may be inserted without obstruction so far as the abdominal integument and into the abdominal cavity.

95 Instead of utilising a closure for the opening, the annular projection may be formed as a bellows which at its free end is provided with an annular plate for placing in contact with the abdominal integument and the internal volume of the cowling 100 between the bellows and the cowling wall is connected to a vacuum pipe via a connector.

In order that the invention may be more readily understood, some embodiments thereof will now be described, by way of example, with reference to 105 the accompanying drawings, in which:—

Figure 1 is a vertical media cross-section through the cowling of one embodiment of device for use in performing examinations and surgical interventions within the abdominal cavity of a 110 patient and constructed in accordance with the invention,

Figure 2 shows the same cross-section through the cowling of a second embodiment,

Figure 3 shows the same cross-section through 115 the cowling of a third embodiment and taken along the line III to III of Figure 4,

Figure 4 is a plan view of the cowling of the embodiment of Figure 3, and

Figure 5 is a diagrammatic side elevation of one 120 form of support for vertical adjustment of the cowling of any one of the embodiments of Figures 1 to 4.

Referring to Figure 1, there is shown a cowling 1 having its free rim 2 placed on the abdominal integument 10 of a patient. The cowling 1 is provided, in its central surface section, with an opening 3 followed by an inwardly directed projection formed by tubular stub 4 having at its bottom edge a contact flange

5. A connector 8 projects from the cowling 1 for connection to a source of negative pressure, and handles 9 are provided on the cowling 1 for manipulating the same or for suspension in a securing device.

10 A pipe (not shown) leading to a source of negative pressure is connected to the connector 8. To establish a negative pressure within the internal volume 7 defined by the cowling 1 and the abdominal integument 10, the opening 3 is temporarily closed off hermetically, e.g. by placing a hand or lid 14 (see Figure 3) thereon, and then a negative pressure is generated within the internal volume 7. The abdominal integument 10 is raised thereby until it comes into contact with the flange 5 of the stub 4. This position of the abdominal integument 10 is illustrated by chain lines in Figures 1 to 3. Since the internal volume 7 between the abdominal integument 10 and the cowling 1 is placed under vacuum, the opening 3 may be utilised for insertion of instruments for examinations and interventions.

15 Instead of closing off the opening 3 by hand or with the cover 14 (Figure 3) temporarily during connection of the cowling to a source of negative pressure, it is also possible to proceed in the manner shown in Figure 2 to which reference will now be made. In Figure 2, a bellows projection 11 extends into the inside of the cowling 1 from the rim of the opening 3 and is provided at its lower free end with an outer annular plate 12 comprising bottom annular grooves 12a. The annular plate 12 is placed on the abdominal integument 10, and the internal volume 7 defined by the bellows 11, the cowling 1 and the abdominal integument 10 is connected to a source of negative pressure via the connector 8. Upon applying the negative pressure, the annular plate 12 is raised together with the abdominal integument under contraction of the bellows 11 until the annular plate 12 occupies the position shown by the dashed lines in which it bears tightly against internal projections 13, so that, again, instruments of the kind referred to may be brought into action via the opening 3 for examinations and interventions.

20 In the embodiments of Figures 1 and 2, the vacuum connector 8 is situated substantially in the area of the sidewall of the cowling 1. In this connection, the case may arise that the lifting abdominal integument 10 also blocks the connector stub 8, so that the negative pressure prevailing within the internal volume 7 may not be sufficient to assure uniform retention of the lifted abdominal integument throughout the free rim 2.

25 To prevent this blocking of the vacuum connector 8 in any event, one or more circularly arranged lines 15 or orifices 16 are provided in the upper portion of the cowling, as shown in Figures 3 and 4. These orifices 16 are covered by an annular areal member 17 which in conjunction with the cowling forms two annular passages 18 which extend along the two circular lines 15 and which interconnect the orifices 16. A radial passage 19 which interconnects the annular

30 passages 18 is complementarily formed between the areal member 17 and the cowling 1, and is followed by a connector 8 for connection to the vacuum source. The evacuation of the air thus occurs at an appreciable distance from the abdominal integument, so that blocking of the passages 16 by the lifting abdominal integument is prevented in any event, since the said integument comes into contact with the lower rim of the annular projection 4. In the embodiment of Figures 3 and 4, the inwardly directed projection 4 is formed an extension of the wall of the cowling, i.e. by an annular corrugation of the cowling surface and having its peak directed into the inside 35 of the cowling. The cowling 1 and the annular areal member 17 may advantageously be produced from a suitable plastics material which may be transparent or pigmented.

40 As shown in Figure 5, the cowling 1 may advantageously be adjustable in height within a support 21, 22 by means of a crank 23, e.g. by means of a bearer 20 attached to the treatment table. After evacuation, the cowling 1 may thereby be raised for additional lifting of the abdominal integument, to obtain and secure the optimum raised position of the abdominal Integument.

45 It should be observed in conclusion, that the area of the base may differ geometrically from a plane surface to match the lower marginal area of the cowling to the shape of the bodily surface. The annular vacuum space 7 resulting during evacuation of the cowling placed on the abdominal integument may furthermore be divided into separate vacuum compartments, e.g. 50 by the fact that as in the embodiment of Figures 3 and 4, radial partitions situated in the radial plane extend from the annular projection 4 to the periphery, whereof the lower edge is adapted to the outline of the lifted abdominal surface 10.

55 105 Although particular embodiments have been described, it should be appreciated that various modifications may be made without departing from the scope of the invention.

#### CLAIMS

110 1. A device for use in performing examinations and surgical interventions within the abdominal cavity of a patient, characterized by a cowling having a marginal section which is applicable to the abdominal integument, said cowling having a 115 temporarily closable opening in an upper portion thereof and an annular projection directed into the inside of the cowling and being in communication with said opening, said annular projection having a free end which is applicable in sealing contact 120 with the abdominal integument, whereby the abdominal integument may be raised by generating a negative pressure within the cowling.

125 2. A device as claimed in claim 1, characterized in that the annular projection is a tubular stub comprising an areal exposed marginal rim.

3. A device as claimed in claim 1, characterized in that the annular projection is formed by an annular corrugation of the cowling surface and having its peak directed into the inside of the

cowling.

4. A device as claimed in claim 3, characterized in that above the downwardly directed peak of the annular corrugation encircling the said opening,

5 the cowling comprises at least one circular line of orifices, there being at least one connecting space for the orifices which is communicable via a radial passage and a connector with a vacuum source.

10 5. A device as claimed in claim 4, characterized in that there are two circular lines of orifices, two connecting spaces which are of annular form and in that the radial passage also interconnects said connecting spaces.

15 6. A device as claimed in claim 4 or 5, characterized in that the said orifices are covered by an annular areal member which in conjunction with the cowling defines said connecting space or spaces, the or each connecting space

20 interconnecting said orifices along the or each line of orifices.

7. A device as claimed in claim 6, characterized in that the cowling and the areal member consist of a transparent or pigmented plastics material.

25 8. A device as claimed in claim 1, characterized in that the annular projection is in the form of a bellows extending from an upper edge of said opening and having at its free end an annular plate which is applicable to the abdominal integument,

30 and in that the internal volume of the cowling between the bellows, the cowling and the abdominal integument is connectible to a source of negative pressure via a connector.

9. A device as claimed in any one of claims 1 to

35 8, characterized in that the said opening is closable hermetically by means of a hand or a releasable cover.

10. A device as claimed in any one of claims 1 to 9, characterized in that the cowling is equipped at its outer side with handles or fastening means.

40 11. A device as claimed in any one of claims 1 to 10, characterized in that the cowling is attached to a vertically adjustable bearer.

12. A device as claimed in any one of claims 1 to

45 11, characterized in that the cowling has an optional base area geometry and in that the free marginal area is adapted to the body surface with which it is to be placed in contact.

13. A device as claimed in any one of claims 1 to 12, characterized in that the annular vacuum volume of said cowling is replaced by an optional number of separate vacuum compartments which may be placed in contact with the body surface.

14. A device for use in performing examinations and surgical interventions within the abdominal cavity of a patient, substantially as hereinbefore described with reference to Fig. 1 of the accompanying drawings.

15. A device for use in performing examinations and surgical interventions within the abdominal cavity of a patient, substantially as hereinbefore described with reference to Fig. 2 of the accompanying drawings.

16. A device for use in performing examinations and surgical interventions within the abdominal cavity of a patient, substantially as hereinbefore described with reference to Figs. 3 and 4 of the accompanying drawings.

17. A device for use in performing examinations and surgical interventions within the abdominal cavity of a patient, substantially as hereinbefore described with reference to Fig. 5 of the accompanying drawings.